1.
Dr. Josef Stefan IV. S. 92.

Akustik.

vSmoluchowski

Akustik

[illegible] Variat. [illegible]

[illegible]

[illegible]

[illegible] Var. [illegible] 30 [illegible] sec.; [illegible]

Var. [illegible]

[illegible] 30–40.000

[illegible]

Pythagoras [illegible]

[illegible] Taylor theoret.

[illegible] Mersenne [Harmonie 1635] experim. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] Orgelpfeifen.

[illegible] theor. [illegible]

[illegible] Sirene [illegible] Cagniard de la Tour [illegible]

[illegible] Ak. [illegible]

[illegible]

[illegible]

Dur Scala C D E F G A H C

[illegible] Octave [illegible] $1 : \frac{1}{2}$

[illegible] $1 : 2$

[illegible] Sirene

2 [illegible]

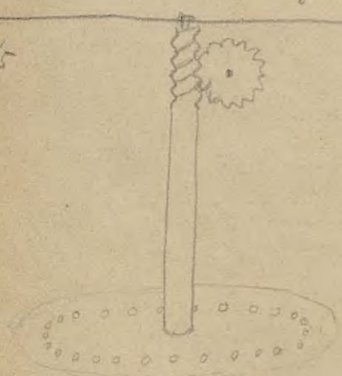
[illegible] Quint $\frac{2}{3} : 1$

$\frac{3}{2} : 1$

rel. [illegible]:

$1 \quad \frac{9}{8} \quad \frac{5}{4} \quad \frac{4}{3} \quad \frac{3}{2} \quad \frac{5}{3} \quad \frac{15}{8} \quad 2$

4/5



[illegible]

[illegible]

$\sigma = $ Verdichtung

$\sigma = a \sin 2n\pi t$

$\sigma = 0 \qquad 2n\pi t = \pi$

$\qquad\qquad 2\pi$

$\qquad\qquad 3\pi$

$t = \frac{1}{2n}, \; 2\frac{1}{2n}, \; 3\frac{1}{2n}, \ldots$

$\frac{d\sigma}{dt} = 2n\pi a \cos 2n\pi t$

$\frac{d\sigma}{dt}$ [illegible]

$\frac{d\sigma}{dt} = 2n\pi a \left[-1, +1, -1, +1, \ldots\right]$

[illegible]

$t_1 = \frac{1}{n} =$ [illegible] [illegible $\frac{1}{2n}$ [illegible]]

[illegible]

[illegible]

[illegible]

$\sigma' = a' \sin 2n'\pi t$

$\sigma + \sigma' =$ [illegible] $\qquad n' > n$

$n' = n + x$

$\sigma + \sigma' = a \sin 2n\pi t + a' \sin(2n\pi t + 2x\pi t)$

$= a \sin 2n\pi t + a' \sin 2n\pi t \cos 2x\pi t +$

$+ a' \cos 2n\pi t \sin 2x\pi t$

$= (a + a' \cos 2x\pi t) \sin 2n\pi t + a' \sin 2x\pi t \cos 2n\pi t$

$a + a' \cos 2x\pi t = A \cos \varphi$

$a' \sin 2x\pi t = A \sin \varphi$

$\sigma + \sigma' = A \sin (2n\pi t + \varphi)$

$a^2 + 2aa' \cos 2x\pi t + a'^2 = A^2$

(Produkt) [illegible] 2 per. fc.

[illegible]

[illegible]

$A = 0$ [illegible] $a^2 + a'^2 + \dots = 0$

$a = a'$ $\quad \cos 2x\pi t = -1$

[illegible] $A =$ [illegible]

Maxim. [illegible] $\cos 2x\pi t = +1$

$2x\pi t = 0,\ 2\pi,\ 4\pi,$ ——

$t = 0,\ \frac{1}{x},\ 2\frac{1}{x},\ 3\frac{1}{x},$ ——

[illegible]

[illegible]

5/5 Monochorde [illegible] horiz. [illegible]

vertik. [illegible]

[illegible]

[illegible] Mersenne (1635)

Sauveur (1701) [illegible]

[illegible]

[illegible] Octave.

[illegible] $\frac{1}{2}$, $\frac{1}{3}$ [illegible]

[illegible]

[illegible] [[illegible]]. [illegible]

[illegible] 2te [illegible]

[illegible] Octave [illegible]

[illegible]

[illegible] $\frac{1}{3}$ [illegible] $\frac{1}{3}$ [illegible] etc.

[illegible] $\frac{1}{4}$ [illegible] 3/4 [illegible] $\frac{1}{4}$ [illegible]

[illegible] Sauveur.

[illegible] : Octave etc. [illegible]

[illegible]

obertöne			
Grundton	Octave	Quint d. Octave,	2te Octave
1. [illegible]	2 [illegible]	3. [illegible]	

[illegible]

[illegible]

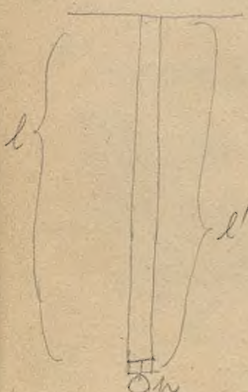
[illegible]

[illegible] z.B. [illegible]

[illegible]

6/5 [illegible]

[illegible] Elastic.



[illegible]

[illegible] Newtons [illegible] Hooke

[illegible] $(l'-l) = \eta \frac{P}{q} l$

$$P = \frac{q(l'-l)}{\eta l} = \mathfrak{E} q \frac{l'-l}{l}$$

$\frac{l'-l}{l}$ = relat. [illegible] $\frac{1}{\eta} = \mathfrak{E}$

$\mathfrak{E}$ = Elasticitätscoëfficient

$q = 1 \,|\, l'-l = l \,|$ [illegible]

$P = \mathfrak{E}$ $= \mathfrak{E}$, [illegible] $= 1$.

z.B. Cu [illegible] 1 mm² [illegible] $\mathfrak{E} = 10\,000$ kg

1 cm² $\mathfrak{E} = 1\,000\,000$ kg

[illegible]

[illegible]

[illegible]

[illegible] elast. [illegible]

[illegible] elast. [illegible] z.B. [illegible] Torsion

[illegible] Wilh. Weber [illegible] Torsions[illegible] const.

$X = $ [illegible] $\qquad X' = $ [illegible] α'

$Z = $ [illegible] $\qquad Z' = $ [illegible]

$m \dfrac{d^2\xi}{dt^2} = -$ [illegible] $+$ [illegible]

$m \dfrac{d^2(x+\xi)}{dt^2} = -$ [illegible] $= $ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$= [illegible] = [illegible]$

$[illegible] = [illegible]$

$[illegible] \frac{d}{dx} [illegible]$

$[illegible] \frac{d^2}{dx^2} = \frac{d}{dx} [illegible]$

$$\rho = P + \mathcal{E} [illegible]$$

$$[illegible]^2 = ([illegible] - x - [illegible])^2 + (\zeta - [illegible])^2$$

$$= \left(\lambda + \lambda \frac{d\xi}{dx} \right)^2 + \lambda^2 [illegible]^2$$

$$= \lambda^2 \left[1 + 2 \frac{d\xi}{dx} + [illegible] \right]$$

[illegible]

$$\rho' = P + \mathcal{E} [illegible]$$

[illegible]

$\frac{d\xi}{dx}$ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$T = Ae^{\ldots t} \ldots t$

[illegible]

[illegible]

$\frac{d^2T}{dt^2} = -\alpha^2 T$

$T = A\cos\alpha t + \ldots$

[illegible]

[illegible]

$\xi =$ [illegible]

[illegible]

$x = 0 \quad \xi = 0$

$x = l \quad \xi = 0$

[illegible]

$\xi =$ [illegible] $= 0$

[illegible]

$\xi = D$ [illegible]

$x = l$

[illegible]

[illegible]

[illegible]

[illegible] $= 0$ [illegible]

[illegible]

$\xi =$ [illegible] $\frac{n x}{l} \Big[$ [illegible] $\Big]$

$DA =$ [illegible]

$\xi =$ [illegible] $\frac{x}{l} \Big[F$ [illegible] $\Big]$

$h=1$

1^{st}

A

$x = \frac{1}{2}$

[illegible]

$y = $ [illegible]

[illegible]

$\frac{dy}{dt} = -$ [illegible]

[illegible]

$t = 0$ $y = \varphi x$ $\frac{dy}{dt} = $ [illegible]

$\varphi x = F_1$ [illegible]

$\varphi x_1 = $ [illegible]

[illegible]

$$= \frac{l}{2}$$

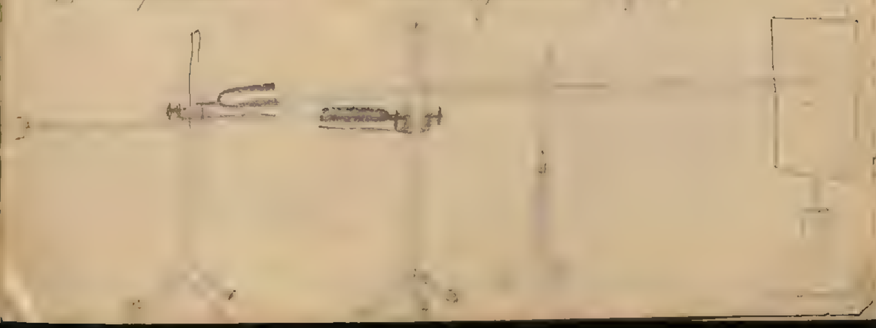
etc.

[illegible]

$$F_i = \frac{2}{l}\int_{0}^{\lambda} \frac{cx}{\lambda} \sin\frac{i\pi x}{l}\,dx + \frac{2}{l}\int_{\lambda}^{l} [illegible]\,dx$$

[illegible]

131. Expérience [illegible] de Fresnel.



[illegible]

$y = \frac{1}{t}$ [illegible]

[illegible]

$x = a\cos 2t$, $y = b\sin t$

$x = a\cos^2 t - a\sin^2 t$

$x = a - 2a\sin^2 t$

$x = a - \frac{2a}{b} y^2$

$(a-x)\frac{b^2}{2a} = y^2$: Parabel

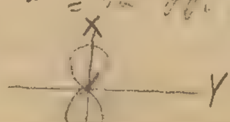
$x = a\sin 2t$, $y = b\sin t$

$x = 2a\sin t\cos t$

$x^2 = 4a^2\sin^2 t\,[1-\sin^2 t]$

$x^2 = 4a^2 \frac{y^2}{b^2}\left[1 - \frac{y^2}{b^2}\right]$ [illegible]

[illegible]



$x =$

$F_1 = F_2 = 0$

$-\frac{c}{n\pi}\cos\frac{n\pi x}{l} =$

$$\frac{Q}{\rho} = a^2$$

[illegible]

$x^2 =$ [illegible]

[illegible]

$y = 0$

[illegible] $= 0$

[illegible]

$\xi =$ [illegible]

[illegible]

$2n\,a = a$ [illegible]

$= a$ [illegible]

$n =$ [illegible]

[illegible]

[illegible]

$\rho X - \ldots = 0$ [illegible]

$p = f(x, y)$ $\qquad$ $\rho X + \frac{\partial p}{\partial x} = 0$

$p' = f(x+\alpha, y)$ $\qquad$ $\rho Y - \frac{\partial p}{\partial x} = 0$ [illegible]

[illegible]

$F_x =$ [illegible]

[illegible]

Euler's [illegible]

[illegible]

$\frac{u'-u}{\tau} =$ [illegible] $= F_x$

$u = \varphi(x\,y\,z\,t)$

$u' = \varphi(x+u\tau,\ y+v\tau,\ z+w\tau,\ t+\tau)$ [illegible]

$= u + \frac{d\varphi}{dx}u\tau + \frac{d\varphi}{dy}v\tau + \frac{d\varphi}{dz}w\tau + \frac{d\varphi}{dt}\tau$

[illegible]

$$\left\{\begin{aligned} -\frac{dp}{dx} &= \rho\,\frac{du}{dt} + \text{[illegible]} \\ \frac{d\rho}{dt} &+ \frac{d\rho u}{dx} = 0 \\ p &= A\cdot\rho^{k} \end{aligned}\right.$$

[illegible]

19/5

$\frac{d\sigma}{dt} = - \ldots \frac{\ldots}{dx}$

$p = p_0 [1 + k\sigma]$

$k = \ldots$

$\frac{a}{6} \ldots \frac{d}{dx}$

$6 = A \ldots [\ldots]$

$+ \ldots [\ldots]$

$\alpha = \ldots$

$2v \ldots$

$x = 0$

$x = l$

I $\frac{dy}{dx} = 0$ $\frac{d6}{dx} = 0$

$\frac{d6}{dx} = \ldots$

$B_1 = D = 0$

$\frac{d6}{dx} = - \ldots A \ldots + \ldots]$

$\beta l = \pi, 2\pi, 3\pi$

$\beta = \frac{\pi}{l} \ldots$ $\alpha = \ldots$

[illegible]

$u = a \sin 3x\,[\,C\cos t - A\sin t\,]$ [illegible]

[illegible]

$x = \frac{l}{2}$ [illegible]

[illegible] $= 0$

[illegible] $x = \frac{l}{2}$

$u =$

< 0

< 0

IV: [illegible]

[illegible]

$\sigma =$ [illegible]

[illegible]

$\sigma =$ [illegible]

$+ \sin$ [illegible]

[illegible]

$- \frac{d}{dx} =$ [illegible] $\qquad p - p_0$ [illegible]

[illegible]

$- 2 \frac{d\sigma}{dx} = \frac{d}{dt}$ [illegible]

[illegible]

$\frac{n x}{l} = \frac{n}{2} \qquad \underline{x} = \frac{l}{2}$ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$\theta = 0$ [illegible]

$\frac{d\theta}{dx} =$ [illegible]

$\beta = 0$

$\theta = \sin \alpha$ [illegible]

$0 =$ [illegible] βl

$\beta l = \frac{\pi}{2}$, [illegible]

[illegible]

[illegible]

[illegible]

[illegible] $x = l$ $\quad \theta = 0$ [illegible]

[illegible]

[illegible]

[illegible]


Z
Y

[illegible]

24 [illegible]

$\mu \frac{d^2\xi}{dt^2} = P \frac{d^2\xi}{dx^2}$ $\mu' \frac{d^2\xi'}{dt^2} = P \frac{d^2\xi'}{dx^2}$

[illegible]

$\xi = [A \sin \alpha t + B \cos \alpha t][C \sin [illegible] + D \cos [illegible]]$

$x = 0$, $\xi = 0$ $D = 0$

$\xi = [illegible] [F \sin \alpha t + G \cos \alpha t]$

$\alpha^2 = a^2 [illegible]$

$\xi' = [A' \sin \alpha t + B' \cos \alpha t][C' [illegible] + D' [illegible]]$

[illegible] $x = l$, $\xi' = 0$

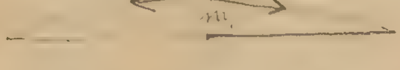
$\xi' = $ [illegible]

$=$ [illegible]

$\xi' = $ [illegible]

$x = d$ [illegible]

F [illegible]



$$m_1 \frac{d^2 [illegible]}{[illegible]} = P\sin [illegible] - P\sin [illegible]$$
$$= [illegible] \frac{d [illegible]}{dx} - P\frac{d\gamma}{dx}$$

[illegible]

[illegible]

[illegible]

$\lambda\,[F \ldots]$ [illegible]

[illegible]

$\ldots \lambda = u$ [illegible]

[illegible] $= u \frac{\partial \lambda'}{\partial \ldots}$

$$\lambda \frac{\operatorname{tg} u}{u} = - \frac{\operatorname{tg} \ldots}{\frac{\partial u}{\partial \ldots}}$$

$$\operatorname{tg} \lambda = - \frac{\operatorname{tg} u \frac{\partial \lambda'}{\partial \ldots}}{\ldots \frac{\partial \lambda'}{\partial \ldots}} \lambda'$$

[illegible]

[illegible]

$\xi = A$ [illegible]

$\xi' = A$ [illegible] $(l-x)$ [illegible]

[illegible]

$$\frac{d^2\xi}{dt^2}\left[\,[illegible]\,\right] = \mathcal{E}\rho'\frac{d\xi'}{dx} - \mathcal{E}\rho\frac{d\xi}{dx}$$

[illegible]

[illegible]

$$= -\frac{P}{x_2}\Big[\ [illegible] - x_2\ [illegible]\ \Big]$$

$$= -\ [illegible]$$

$$\int [illegible]\, dx = -\frac{P}{[illegible]}\Big[\ [illegible]\ \Big]$$

$$x_2^2 - x_1^2\ [illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$\ldots F(x+at)$

$\xi = f(x-at) + F(x+at)$

$\xi = $ [illegible]

$= \frac{a}{2}\Big[$ [illegible] $\Big]$

$t=0 \qquad \xi = \varphi(x)$

$$\frac{\partial \xi}{\partial t} = \psi(x)$$

$$\frac{d\xi}{dt} = -a\,f'(x-at) + a\,F'(x+at)$$

$t=0 \quad \Big| \quad \varphi$

I

II

I_0 [illegible]

I 0 [illegible]

II t [illegible] $= 0$

$\xi = \frac{1}{2}$ [illegible]

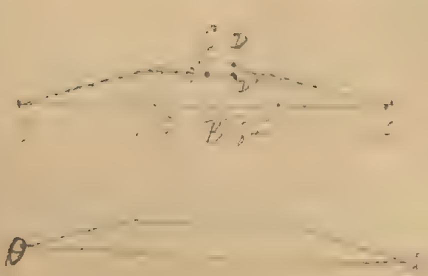
$= -\frac{a}{2}$ [illegible]

$\xi = \frac{1}{4}$ [illegible] $- \frac{1}{4}$ [illegible] $- \frac{1}{4}$ [illegible]

$= \frac{1}{4}\, \varphi(x - at)$ [illegible] $+ \frac{1}{4}\, \varphi(x + at)$ [illegible]

$= \frac{1}{2}$ [illegible]

[illegible] $\xi = \frac{\varphi}{2}$ [illegible]



[illegible]

[illegible] < 0 [illegible]

[illegible]

$x = l$ [illegible] $y =$ [illegible]

[illegible] A [illegible]

$y = A \sin$ [illegible]

[illegible]

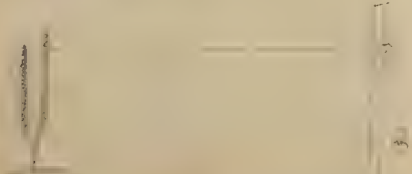
[illegible]

[illegible] $- 2A \cos$ [illegible]

[illegible] $\frac{4c}{a}$ [illegible]

[illegible]

[illegible] Experimente:



$$\alpha = -b \pm \sqrt{\ldots}$$

we $b > \beta a$

$f'' = \frac{c^2}{a^2} f''$

$a = c$

$\lambda = \frac{bc}{a^2}$

$f'' = \dots f + \frac{a^2}{c^2} f'' \dots$

$$\beta_m^2 a^2 - b^2 = \beta_m^2 c^2$$

$$c^2 = a^2 - \frac{b^2}{\beta_m^2}$$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

I. [illegible]

[illegible]

[illegible]

[illegible]

$$\rho_0 \frac{dc}{dt} + \frac{d}{dx} \text{[illegible]}$$

[illegible]

$$= -v_0 \frac{\partial^2 \sigma}{\partial t^2}$$

II.

$\sigma = \varphi(r)$

$$\frac{d\sigma}{dx} = \frac{d\sigma}{dr}\frac{dr}{dx} = \frac{d\sigma}{dr}\frac{x}{r} \qquad \frac{d^2\sigma}{dx^2} = \frac{d^2\sigma}{dr^2}\frac{dr}{dx}\frac{x}{r} + \frac{d\sigma}{dr}\frac{1}{r} +$$

$$+ \frac{d\sigma}{dr}\, x\, \frac{d}{dx}\frac{1}{r}$$

[illegible]

$p = p_0$ [illegible]

[illegible]

$\dfrac{d u}{d t}$ [illegible]

$- a^2$ [illegible]

$\boxed{a^2 \text{[illegible]}}$

17/3 [illegible]

[illegible]

$\sigma = \sigma' + \sigma''$

$\sigma' = A$ [illegible] $\left[\text{[illegible]} \right]$

2.

Dr. Josef Stefan IV S. 92.

Akustik.

MSmoluchowski

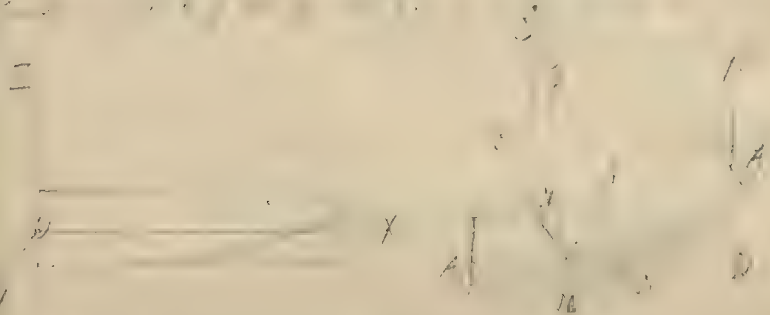
$$\lambda_1 = 90 - \lambda$$

$$\sin\lambda_1 = \cos\lambda$$

$$\frac{\sin\lambda}{\sin\lambda_1} = \frac{a}{a_1} = n$$

[illegible]

ref



$MN \perp$

$AA' = Rq$

[illegible]

$\frac{1}{R} = \frac{\frac{d^2z}{dx^2}}{\left(1+\frac{dz}{dx}\right)^{\frac{3}{2}}}$ [illegible]

$= [illegible] \frac{d^2z}{dx^2}$

$AD = l - x$ [illegible]

$EK \frac{d^2z}{dx^2} = P(l-x)$

$EK \frac{dz}{dx} = P(lx - \frac{x^2}{2}) + C$

$EKz = P\left(l\frac{x^2}{2} - \frac{x^3}{6}\right) + Cx + D$

$x=0 \quad z=0 \quad D=0$

[illegible]

$x=0 \quad \frac{dz}{dx}=0 \quad C=0$

$z = \frac{P}{EK}\left(l\frac{x^2}{2} - \frac{x^3}{6}\right)$

$z_1 =$ [illegible]

$z_1 = \frac{P}{EK}$ [illegible] $= \frac{1}{3}\frac{Pl^3}{EK}$ [illegible]

$x = l$

$= 0$

$= 0$

$$a^2 \frac{d^4 z}{dx^4} = -\frac{[illegible]}{[illegible]^2}$$

$$\frac{d^2}{dx^2} \qquad \frac{d^4}{dx^4}$$

$$z = U \sin \alpha t$$

$$+ a^2 \frac{d^4 U}{dx^4}$$

$$p^4 =$$

$$p = \pm \quad \pm$$

$$U = M_1 e^{bx} + M_2 e^{-bx} + M_3 e + M_4 e$$

$$A \frac{e^{bx} + e^{-bx}}{2} + B \frac{e}{2} + C \quad bx + D \quad bx$$

[illegible]

$x = 0$	$x = l$	$x = 0$	$x = l$
$y = 0$	$\frac{d^2y}{dx^2} = 0$	$y = 0$	$\frac{d^2y}{dx^2} = 0$
$\frac{dy}{dx} = 0$	$\frac{d^3y}{dx^3} = 0$	$\frac{dy}{dx} = 0$	$\frac{d^3y}{dx^3} = 0$

$$\frac{dy}{dx} = k\left[A\,\frac{e^{kx}-e^{-kx}}{2} + B\,\frac{e^{kx}+e^{-kx}}{2} - C\sin kx + D\cos kx\right]$$

$$\frac{d^2y}{dx^2} = k^2\left[A\,\frac{e^{kx}+e^{-kx}}{2} + B\,\frac{e^{kx}-e^{-kx}}{2} - C\cos kx - D\sin kx\right]$$

$$\frac{d^3y}{dx^3} = k^3\left[A\,\frac{e^{kx}-e^{-kx}}{2} + B\,\frac{e^{kx}+e^{-kx}}{2} + C\sin kx - D\cos kx\right]$$

$$0 = A + C$$

$$0 = A\,(\ldots - \ldots)$$

$$0 = A\,\frac{e^{kl}+e^{-kl}}{2} + B\,\frac{e^{kl}-e^{-kl}}{2} - C\cos kl - D\sin kl$$

$$0 = A\,\frac{e^{kl}-e^{-kl}}{2} + B\,\frac{e^{kl}+e^{-kl}}{2} - C\sin kl - D\cos kl$$

[illegible]

$$0 = A\left[\frac{e^{kl}+e^{-kl}}{2} + \cos kl\right] + B\left[\frac{e^{kl}-e^{-kl}}{2} + \sin kl\right]$$

$$0 = A\left[\frac{e^{kl}-e^{-kl}}{2} - \sin kl\right] + B\left[\frac{e^{kl}+e^{-kl}}{2} + \cos kl\right]$$

$t = 0 \quad z = \varphi(x)$

$\frac{dz}{dt} = \psi(x)$

$$\frac{dy}{dx} = -\frac{\alpha}{c} A \cos \alpha\left(t - \frac{x}{c}\right)$$

$$\frac{d^2y}{dx^2} = -\frac{\alpha^2}{c^2} A \sin \alpha\left(t - \frac{x}{c}\right)$$

$$\frac{d^2y}{dt^2} = [illegible] A \sin \alpha\left(t - \frac{x}{c}\right)$$

$$\frac{d^4y}{dx^4} = \frac{\alpha^4}{c^4} A \sin \alpha\left(t - \frac{x}{c}\right)$$

$$-\alpha^2 A \sin \alpha\left(t - \frac{x}{c}\right) + \frac{a^2\alpha^4}{c^4} A \sin \alpha\left(t - \frac{x}{c}\right) = 0$$

$$-\alpha^2 + \frac{a^2\alpha^4}{c^4} = 0$$

$$c^4 = a^2\alpha^2 \quad [illegible]$$

$$c = \sqrt{a\alpha}$$

$$\alpha = \frac{2\pi}{T} \quad [illegible]$$

$$cT = \lambda$$

$$\alpha = \frac{2\pi}{\lambda} c$$

$$c^4 = \frac{a^2 4\pi^2}{\lambda^2} c^2$$

$$c^2 = \frac{a^2 4\pi^2}{\lambda^2}$$

$$c = a\frac{2\pi}{\lambda} \quad [illegible]$$

[illegible]

$$\xi = A \sin \alpha t \sin \beta x$$

$x = l$

$x = 0$

$\sin \beta l$

$$-\alpha^2 = -\frac{P}{\quad}\beta^2 - \frac{\varrho K}{\mu_0}\beta^4$$

$$\frac{a'-a}{a} = \frac{1}{q}P$$

$$a' = a\left[1 + \frac{1}{q}P\right]$$

$$= a\left[1 + x\right]$$

$$= abc\left[1 + x - 2x\right]$$

[illegible]

$M - [illegible] - T [illegible] = 0$

$T = [illegible] \quad T' = [illegible]$

$= T + \lambda \frac{dT}{dx}$

$M' = [illegible] = M + \lambda \frac{dM}{dx}$

$[illegible] \qquad - \lambda \frac{d [illegible]}{dx} - [illegible] = 0$

$[illegible] = 0 \qquad \frac{dM}{dx} + T = 0$

[illegible]

[illegible]

[illegible]

$\xi_1 = \frac{1}{\varepsilon} \cdot - x\, \mu_1$

$\eta_1 = -\beta\, \xi_1$

$\zeta_1 = -\beta\, \eta_1$

$\quad = \frac{\mu_2}{\varepsilon}$

$\xi_2 = -\beta\, \eta_2$

$\zeta_2 = -\beta\, \eta_2$

$\eta_3 = \frac{\mu_3}{\varepsilon}$

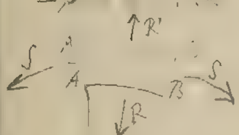
$\xi_3 = -\beta\, \eta_3$

$\zeta_3 = -\beta\, \xi_3$

$$\xi_1 + \xi_2 + \xi_3 = \xi = \frac{1}{\varepsilon}\mu_1 - \beta\frac{\mu_2}{\varepsilon} - \beta^2\frac{\mu_3}{\varepsilon}$$

$$= \frac{\mu_1 - \beta\mu_2 + \beta^2\mu_3}{\varepsilon}$$

[illegible]



$A D D' \ldots S$

$\int \ldots \frac{\varphi}{2} = \int \ldots \frac{\varphi}{2} = \int \frac{\varphi}{2}$

$- A D D' \ldots \frac{\varphi}{2}$

$- D C C' D' . \int . \frac{\varphi}{2}$

B [illegible]

$= 0$ [illegible]

[illegible] $= 24.$ [illegible]

[illegible] $\bar{a}a$ [illegible] $\bar{a}a$ [illegible]

[illegible] $= 0$

[illegible] $- 2$ [illegible] $= 0$

[illegible]

u' [illegible]

$u =$ [illegible]

$u' =$ [illegible]

B' [illegible]

A' [illegible]

A [illegible] $\frac{BD - A'C'}{[illegible]} =$ [illegible]

$\frac{BD - AC}{C} =$ [illegible]

θ D [illegible] $=$ [illegible]

[illegible]

$\frac{u}{r} =$ [illegible]

[illegible]

$u =$ [illegible]

$\frac{du}{dr} =$ [illegible]

$R - 2$ [illegible] $= (1 - \mu)$ [illegible]

$\frac{dr^2}{dr} - 2rS = 0$

[illegible]

$4R + 4\frac{d}{dr}$ [illegible]

$\frac{d(r^2)}{dr} = 2S - R$

$R - 2rS =$ [illegible] $- 2$ [illegible]

$$\left.\begin{aligned} R &= \frac{d(r S)}{dr} \\ \frac{dr^2}{dr} &= 2rS \end{aligned}\right\}$$

$$r^2 R = A r^{n+2}$$

$$R = A r^n$$

$$\frac{d^2(A r^{n+2})}{dr^2} = 2 A r^n$$

$$(n+2)(n+1) r^n = 2 r^n$$

$$n^2 + 3n + 2 = 2$$

$$n = 0 \qquad n = -3$$

$$R = A + \frac{B}{r^3}$$

$r=0 \quad r=\infty$

$R = A$

2).

$r_0 = n \quad r_1 =$ Rad.

$R_0 \quad R_1$

$$S = A - \frac{B}{2r^3}$$

$$2rS = \frac{d}{dr} = 2Ar - \frac{B}{r^2}$$

$$S = A - \frac{B}{2r^3}$$

$$\cancel{S = A - \frac{B}{2r}}$$

$r_0 \quad r_0 + u_0$

$$\frac{u}{r} = \frac{1 - S}{E} - \beta \frac{R}{E}$$

$\frac{u}{r} =$ [illegible]

$= \frac{1 - \dots}{E}$ [illegible]

[illegible] $B = 0$

$\frac{u}{r} =$ [illegible] $\frac{A}{E} = (1-2\nu)\frac{A}{E}$

[illegible] $\frac{\dots}{3} =$ [illegible]

$r^3 = \frac{(\dots + \alpha)^3}{3} =$ [illegible]

$r^3 - r^3 =$ [illegible]

[illegible] $r_1 = r_0 + \alpha$

$r_1^3 - r_0^3 = (r_0 + \alpha)^3 - r_0^3 = 3 r_0^2 \alpha$

$A = \frac{\dots r_0 + \dots}{3 r_0^2 \alpha} = \frac{(R_1 - R_0) r_0^3 + 3 R_1 r_0^2 \alpha + \dots}{3 r_0^2 \alpha}$

$A = \frac{(R_1 - R_0)}{3\alpha} r_0 + \dots$

$B = \frac{r_0^6 (R_1 - R_0)}{3 r_0^2 \alpha} = \frac{r_0^4 (R_0 - R_1)}{3\alpha}$

$\frac{u_0}{r_0} = \frac{(1-2\nu)}{E} \frac{(R_1 - R_0)}{3\alpha} r_0 - \frac{1}{2} \frac{(1+\nu)}{E} r_0 \frac{(R_0 - R_1)}{3\alpha}$

$= \frac{r_0}{3\alpha E} \left[R_1 - R_0\right] \left[1 - 2\nu + \frac{1}{2} + \frac{1}{2}\nu\right]$

[illegible]

$P_1 = -p$

$P_0 = p + P$

$R_1 - P_1 + P$

$\frac{U_0}{T_0} = [illegible] P$ [illegible]

$= [illegible] P$ [illegible]

[illegible]

[illegible]

28/6 Wheatstone's Kaleidophon

Trans.

Octave

$\sqrt{2} : 1$ Octave.

e Octave; [illegible] [B.J] [illegible]

[illegible]

[illegible] – transv [illegible] – longit [illegible]

[illegible]

[illegible]

[illegible] ⊥ [illegible]

[illegible] Reson. [illegible]

[illegible]

30/6 $z = U \sin \alpha t$

$$U = A\,\frac{e^{bx}+e^{-bx}}{2} + B\,\frac{e^{bx}-e^{-bx}}{2} + C\cos bx + D\sin bx$$

$$\frac{d^4U}{dx^4} = -\cancel{b}^4 U$$ [illegible] Coeff. [illegible]

[illegible]

$b_1\ b_2\ b_3$ — [illegible]

[illegible] U [illegible] A [illegible]

$$U = \cancel{A}\left(\frac{e^{bx}+e^{-bx}}{2} + \frac{B}{A}\,\frac{e^{bx}-e^{-bx}}{2} + \frac{C}{A}\right.$$

$$U_1 = \cancel{A_1}\left(\frac{e^{b_1x}+e^{-b_1x}}{2} + \right.$$

$$U_2 = \cancel{A_2}\left(\frac{e^{b_2x}+}{2}\right.$$

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